

## Supplementary information

### **Hyaluronic acid mediated biomineralization of multifunctional ceria nanocomposites as ROS scavengers and tumor photodynamic therapy agents**

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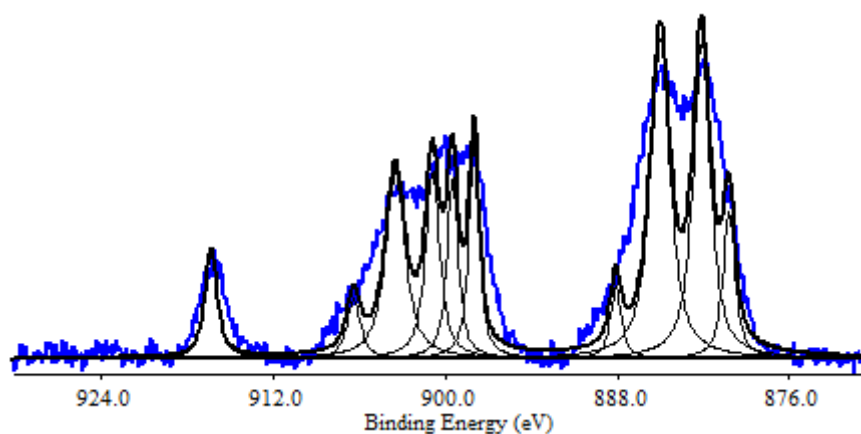
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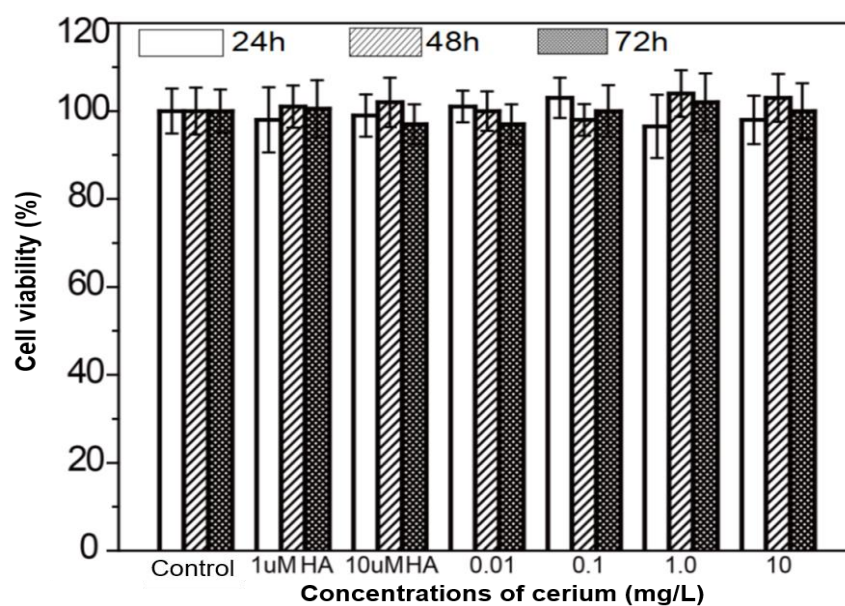
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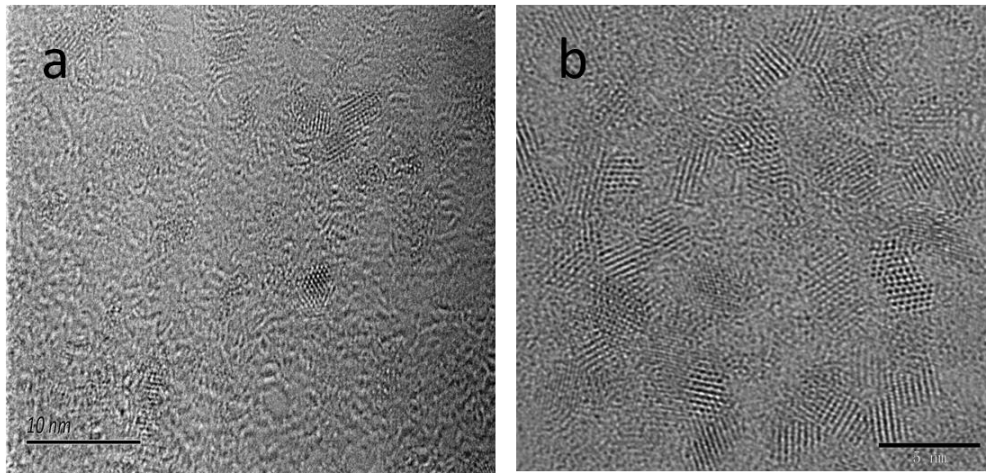
lili198418@163.com



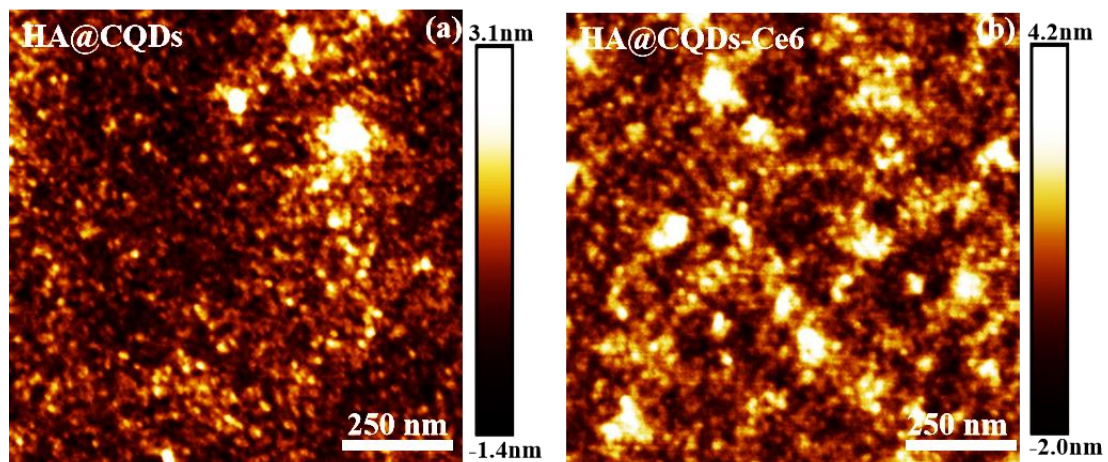
**Fig. S1.** The integrated XPS spectrum related to the valence state of cerium ions and corresponding binding energy peaks for  $\text{Ce}^{3+}$  (880.20, 885.00, 899.50 and 903.50 eV) and  $\text{Ce}^{4+}$  (882.10, 888.10, 898.00, 900.90, 906.40 and 916.35 eV).



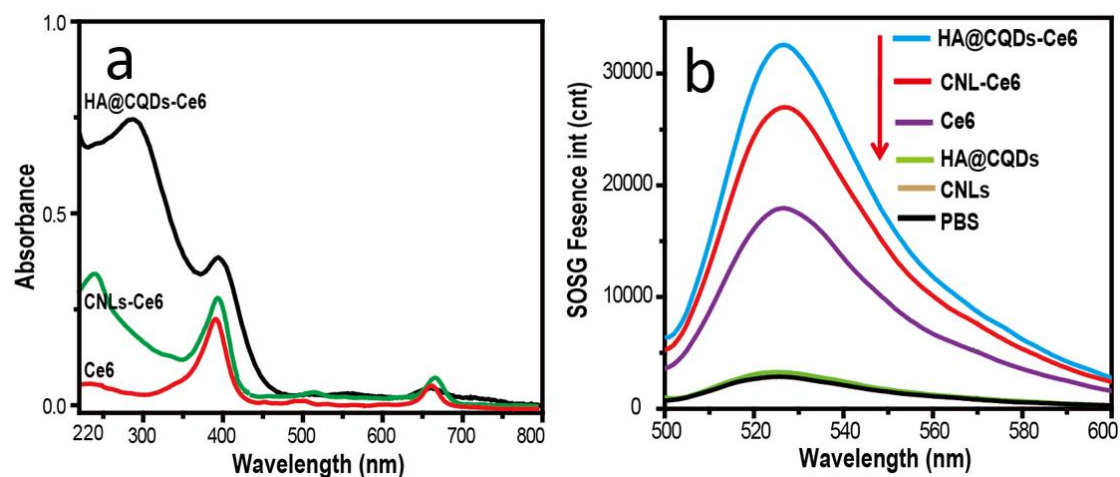
**Fig. S2.** Relative cell viability data obtained from the CCK-8 assay of L-02 Cell after treated with various concentrations of HA@CQDs for 24h, 48h and 72h.



**Fig. S3.** The TEM spectrum of CNLs-Ce6 (a, scale bar 10nm) and HA@CQDs-Ce6 (b, scale bar 5nm)



**Fig. S4.** The AFM spectrum of HA@CQDs (a) and HA@CQDs-Ce6 (b)



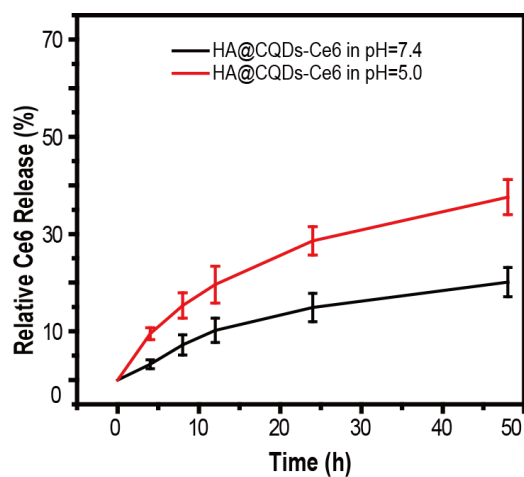
**Fig. S5.** (a) The UV/vis spectrum of Ce6, CNLs-Ce6, HA@CQDs-Ce6, (b) Singlet oxygen generation of HA@CQDs-Ce6, CNLs-Ce6, free Ce6, HA@CQDs, CNLs and PBS (1 mM) after irradiation with 660 nm laser (0.2 W/cm<sup>2</sup>) for 5min.

**Table s1** the ALT and AST value of the mice treatment with PBS and HA@CQDs

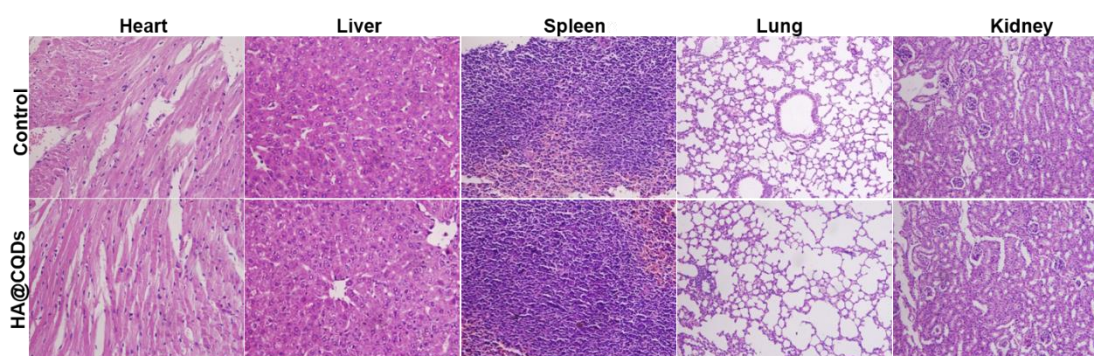
	ALT	AST
PBS	32.4±15.7	40.9±15.3
HA@CQDs	42.9±22.5	63.9±16.7

**Table s2** the hematological markers value of the mice treatment with PBS and HA@CQDs

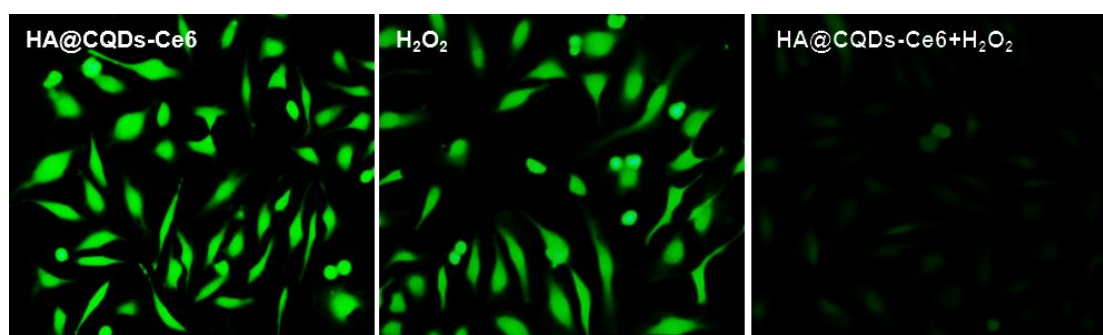
	WBC	HGB	RBC	HCT	MCV	MCHC	PLT	PCT
PBS	6.69±1.03	108±20.1	7.07±1.38	32.3±6.56	45.6±1.65	338±12.7	894±192	0.52±0.11
HA@CQDs	6.50±1.27	112±15.8	6.93±1.34	31.6±5.69	45.7±1.31	358±24.1	863±219	0.52±0.12



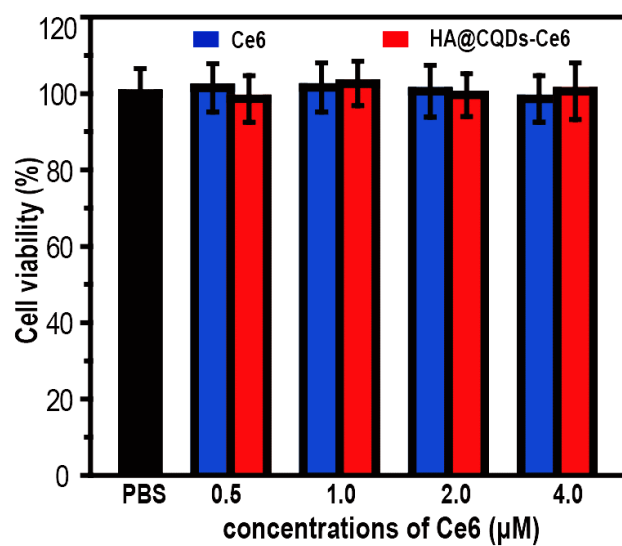
**Fig. S6.** Release of Ce6 from HA@CQDs-Ce6 in pH 7.4 and 5.0.



**Fig. S7.** H&E stained images of major organs collected from untreated mice and intravenously injected with HA@CQDs at day 2 post treatment.



**Fig. S8.** the images of intracellular  $O_2$  generation after HeLa cells incubated with HA@CQDs-Ce6,  $H_2O_2$  and HA@CQDs-Ce6/ $H_2O_2$ .



**Fig. S9.** Relative cell viability data obtained from the CCK-8 assay of HeLa cells after treated with various concentrations of Ce6, and HA@CQDs without light irradiation by 662 nm laser.